

After Final Response dated October 28, 2003

Appl. No. 09/716,734

Atty. Docket No. 0100.0100120

REMARKS

Applicants respectfully traverse and request reconsideration.

Rejection of Claims Under 35 U.S.C. § 102

Claims 1, 3-9, 12 and 17 currently stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,236,568 (“Lai”). Applicants respectfully traverse and submit that Lai fails to disclose all of the claimed limitations and therefore the present rejection is improper.

As understood, Lai is directed to, *inter alia*, high heat, dissipating structure for an integrated circuit using an IC3, flexible adhesive layer 6, a buffer pad 5 and a heat conductive element 4. Based on the disclosed structure of Lai, using the buffer pad 5 allows for reduction of thermal compressive stress load. FIG. 2 clearly illustrates the structure of the conductive piece 4 providing an exterior outlet for any dissipating heat. Furthermore, col. 6, lines 13-14 succinctly delineates the heat dissipating flow of the integrated circuit chip 3 to the flex adhesive layer 6 to the buffer pad and the heat conductive piece 4. While Lai discloses an encapsulant 9, the encapsulant does not encapsulate the heat sink, but rather only encapsulates the other elements, as the Lai system teaches the conductive piece 4 being exposed for atmospheric dissipation of heat.

Claims 1 and 17 succinctly recite limitations to, among other things, “an external epoxy molding material disposed exterior to the metallic heat sink such that the metallic heat sink, the second substrate and the first substrate are encapsulated by the external epoxy molding material.” Therefore, in order for Lai to anticipate the present invention, Lai must succinctly disclose the material 9 encapsulate the heat sink, the second substrate and the first substrate. As clearly illustrated by FIG. 2, Lai does not teach encapsulation of the metallic heat sink, but rather shows the top level of the heat sink being exposed to the atmosphere.

Furthermore, while the Examiner interprets claim limitations in view of their ordinary meaning, a dictionary definition of the word encapsulate, as defined by the Miriam-Webster Dictionary is “to enclose in or as if in a capsule,” further giving the example of “a pilot

encapsulated in the cockpit.” Therefore, the ordinary meaning of the word encapsulate is to fully enclose the element and the present invention succinctly claims encapsulating the metallic heat sink. Whereas, Lai explicitly and succinctly discloses the heat sink 4 not being fully encapsulated, but rather being in direct physical direct contact with the atmosphere.

For further reference, the Examiner is specifically directed to col. 6, lines 11-16 which provide that “the heat produced from the integrated circuit chip during operation can be dissipated through the following path: integrated circuit chip 3 → flexible adhesive layer 6 → buffer pad 5 → heat-conductive piece 4 → atmosphere.” Therefore, it is further submitted that Lai in-fact teaches away from the claimed encapsulation but rather teaches the heat conductive piece 4 being in direct physical contact with the atmosphere and not having an encapsulant material between the heat conductive piece and atmosphere. It is submitted that the system of Lai operates in a completely different manner and produces a completely different result because Lai teaches a system in which the heat-conductive piece 4 is in direct physical contact with the atmosphere such that heat dissipation can go directly from the buffer pad 5 to the heat-conductive piece 4 to the atmosphere, whereas the present invention provides a heat conductive path from the claimed metallic heat sink to the external epoxy molding material. Therefore, it is submitted that Lai does not anticipate the present invention and that claims 1 and 17 provide patentable subject matter in view thereof.

Regarding claims 3-9 and 12, Applicants submit these claims contain further limitations which present patentable subject matter in view of the teachings of Lai. For example, claim 3 recite that “the coupling between the metallic heat sink and the second substrate is such as to accommodate movement of the metallic heat sink with respect to the second substrate.” As discussed above, Lai does not disclose the epoxy molding material being external to the metallic heat sink therefore Lai cannot teach further references with regard to the dependent claims. It is submitted that claims 3-9 and 12 contain further patentable subject matter and are allowable not merely as being dependent upon an allowable base claim.

As such, Applicants request reconsideration and withdrawal of the present rejection with regard to claims 1, 3-9, 12 and 17. Should the Examiner maintain the present rejection,

Applicants request a showing in support of the Examiner's interpretation of the term encapsulate to include only covering the sides and underneath but not covering the top of an element, therefore in direct contradiction to the dictionary and common interpretation of the term "encapsulate".

Rejection of Claims Under 35 U.S.C. § 103(a)

Claims 21-23 currently stand rejected as being unpatentable over Lai. Applicants respectfully traverse and submit the present rejection is improper because Lai does not teach or suggest all of the limitations of the claimed present invention of claims 21-23 and therefore one of ordinary skill in the art would not have obviously modified the teachings of Lai to fabricate an integrated circuit.

Applicants respectfully resubmit the above position offered with regard to claims 1 and 17 and submit once again that Lai does not teach or suggest encapsulating of the metallic heat sink. Claim 23 recites "thermally coupling an external epoxy molding material exterior to the metallic heat sink such that the metallic heat sink, the second substrate and the first substrate are encapsulated by the external epoxy molding material." In accordance with the teachings of Lai, the molding material 8 does not encapsulate the metallic heat sink or the heat-conductive piece 4. Therefore, it would not have been obvious for one of ordinary skill in the art to use the teachings of Lai to form the method claimed for fabricating the integrated circuit. In fact, it is further submitted that Lai specifically teaches away from the present limitations as Lai teaches the dissipation of heat through the heat-conductive piece 4 to the atmosphere and does not disclose adding the epoxy material 9 above the element 4, thereby encapsulating it. Furthermore, on col. 3, lines 19-22, Lai states that "the heat dissipating structure of the invention includes: (a) a heat-conductive piece having a first side and a second side with the first side being exposed to the outside of the integrated circuit package." Therefore, Lai specifically teaches not having a material between the heat-dissipating element and the atmosphere. Therefore, it is improper for the Examiner to assert that one of ordinary skill in the art to go beyond the teachings and in direct contradiction to the teachings of Lai to produce the claimed present invention based on the teachings of Lai.

As such, it is submitted that the present rejection is improper and that claims 21-23 contain patentable subject matter in view of the teachings of Lai. Therefore, reconsideration and withdrawal of the present rejection is respectfully requested.

Rejection of Claims Under 35 U.S.C. § 103(a)

Claims 1, 3-9, 12, 17 and 21-23 currently stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lai in view of U.S. Patent No. 5,977,626 (“Wang”). Applicants respectfully traverse and submit that Lai in combination with Wang does not produce the claimed present invention because Lai explicitly teaches away from being combined with Wang.

The Examiner asserts on the bottom of page 6 of the present Office Action that Wang is cited for showing a thermally and electrically enhanced PVGA package, disclosing a metal heat sink 32 coupled to the second surface of the substrate 22 and an external epoxy molding material 30 disposed exterior to the metallic heat sink such that the metallic heat sink and the substrate 22 are encapsulated by the external epoxy molding material.

Applicants respectfully traverse the Examiner’s interpretations of the teachings of Wang in view of Lai as it is submitted, as discussed above, that Lai specifically teaches away from allowing an epoxy material to encapsulate the heat-conductive piece 4. Therefore, assuming *arguendo* that Wang discloses placing an encapsulant epoxy material 30 over a metal heat sink, one of ordinary skill in the art would not be motivated based on the teachings of Lai to allow the epoxy material to encapsulate the heat sink. As Lai specifically teaches the heat dissipating element being in direct contact with the atmosphere, it would be in direct contradiction to the explicit teachings of Lai to in-fact place the external epoxy molding material 30 exterior to the heat sink.

Furthermore, Applicants respectfully traverse the Examiner’s assertion of the teachings of Wang. The Examiner asserts that the external epoxy molding material 30 is disposed exterior to the metallic heat sink such that the metallic heat sink and the substrate are encapsulated by the molding material. In support thereof, the Examiner provides direction to FIGs. 2-7-a of Wang, to which Applicants respectfully submit show the exact opposite of the Examiner’s assertions.

For example, looking specifically at FIGs. 2-4, the molding material 32 does not encapsulate the heat sink 32 but rather provides only a side covering. FIGs. 2-4 illustrate the lack of molding material 30 exterior to the heat sink 32, or other clearly illustrate the heat sink 32 being in direct contact with the atmosphere. Furthermore, on col. 3, lines 53-54, Wang teaches that “the heat spreader is exposed by the molding compound 30.” Therefore, Wang even teaches the heat sink 32 not being encapsulated in accordance with the claim language for encapsulating the metallic heat sink, as claimed in claims 1, 3-9, 17 and 21-23. Therefore, it is submitted that not only does Lai specifically teach away from the encapsulation of the heat dissipater 4, but that Wang in-fact does not even teach encapsulating the heat sink 32 with the external epoxy molding material 30. Therefore, one of ordinary skill in the art would not be motivated to combine these references because Lai specifically teaches away from such combination and even assuming *arguendo* that one would be so motivated, the combination thereof would not produce the claimed present invention because neither reference either individually or in combination thereof teach or suggest the limitation of encapsulating the metallic heat sink within the external epoxy molding, in accordance with the given definition of the term encapsulate, to be fully enclosed or encased therein. Wherein, the Examiner’s interpretation of encapsulate with leaving one area exposed, is not only improper but in direct contradiction to the exact, plain and ordinary meaning of the term “encapsulate.”

Therefore, it is submitted the rejection is improper and should be withdrawn. Should the Examiner maintain the present rejection, Applicants request a showing in support of the Examiner’s position for the interpretation for the term “encapsulate” to mean not fully enclosing all four sides of an element, or all six sides within a three-dimensional space, in contradiction to the plain and ordinary meaning of the term.

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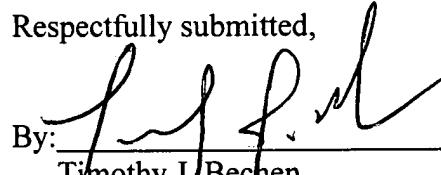
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Accordingly, Applicant respectfully submits that the claims are in condition for allowance and that a timely Notice of Allowance be issued in this case. The Examiner is invited to contact the below-listed attorney if the Examiner believes that a telephone conference will advance the prosecution of this application.

Respectfully submitted,

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